PATENT SPECIFICATION

756,835

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COMPLETE SPECIFICATION

Combined Rebound Damping and Homing Device for a Moving Machine part

We, THE NATIONAL CASH REGISTER COMPANY, of Dayton in the State of Ohio, United States of America, and Baltimore in the State of Maryland, United States of America, a Company incorporated under the Laws of the State of Maryland, United States of America, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

The invention relates to a combined rebound damping and homing device for a moving machine part.

All moving parts in high-velocity machines having intermittent motion must perform their work within a limited number of degrees of a machine cycle, and, therefore, they start and stop one or more times during the machine cycle. When a moving machine part in high velocity is stopped suddenly, it will rebound or vibrate in cycles of varied magnitude, due to the kinetic energy existent.

When such rebound or vibration interferes with the correct functioning of the moving machine part, means must be employed to stop such rebound or vibration in order to overcome the faulty operation, and it is the object of the invention to provide a device which will effectively damp any rebound as well as assist in the homing movement of the moving machine part should the movement of the latter lag.

Accordingly the invention comprises a rebound damping and homing device for assisting the homing of a moving machine part against a fixed stop and inhibiting rebound from the said stop, in which the device includes teeth on the machine part which intermesh with teeth of a rotatable gear, the latter teeth being narrower than the space between the teeth on the machine part so that the gear has a limited independent rotation, whereby during a constant or progressive movement of the machine part the gear is driven thereby, whereas on the retardation of movement of the machine part or the stopping thereof by the fixed stop, the momentum of the gear causes it to make its independent rotation and its teeth to engage the rear of the teeth on the machine part thus to exert a force on the latter in the original direction of movement thereof either to continue to urge the part to its home position or to oppose rebound from the fixed stop.

The above and other subsidiary features of the present invention as applied, by way of example, to one manner of carrying it into effect, will now be described and are illustrated in the accompanying drawing:—

Fig. 1 is a side elevation illustrating the loose running gear in mesh with a rectilinear movable slide;

Fig. 2 is a detail view of a modified loose running gear for use with an exceptionally heavy slide.

Referring to Fig. 1 of the drawing the form of the invention shown therein includes a moving machine part or reciprocating bar 5, slotted to move on two studs 6, said bar being held, by means of a spring 7 connected thereto, in contact with a cam follower 8, pivoted on a stud 9, carried by the machine frame. A spring 10, stronger than the spring 7, maintains the lower end of the cam follower against a cam 11 mounted on a drive shaft 12.

The bar 5 is moved toward the right (Fig. 1) by the spring 7 when the cam 11 rotates the follower arm 8 clockwise (Fig. 1), and, when the high part 13 of the cam 11 passes the end 14 of the follower arm 8, the spring 10 impels the follower arm 8 and the bar 5 leftwardly until arrested by a stop 15, the impact causing the bar 5 to rebound.

To prevent such rebounding movement a gear 16, rotatably mounted on a stud 17, is provided which meshes with teeth 18 carried by the bar 5. The gear 16 is also provided with bevelled teeth 19 which, with the teeth 18, are cut deeper than are standard teeth, to

[*Price* 3/-]

provide clearance 20 between them thereby allowing relative movement between the gear 16 and the bar 5. In other words, both sets of teeth 18 and 19 are of a similar pitch but the thickness of the teeth 19 is less than the thickness of the teeth 18.

The gear is mounted on an eccentric 21 on the stud 17 to provide for further adjustment between the teeth of the gear and the bar, so that a greater or lesser clearance 20, can be obtained when a fine adjustment is required, such adjustment being effected by raising or lowering the gear 16.

When the bar 5 is impelled toward the stop 15, the gear 16 is rotated therewith and acts as a flywheel, and when this occurs, the left sides of the teeth 18 are adapted to engage the right sides of the teeth 19. When the bar 5 is arrested by contact with the stop 15, the gear will continue to rotate an extent permitted by the clearance 20, and the momentum of the gear 16, by its dead weight, thus causes the teeth 19 to strike the right side of the teeth 18 with sufficient force to prevent rebound movement of the bar 5.

It has been determined that the dead weight of the gear should preferably be between 60% and 70% of the dead weight of the bar 5 if the gear is effectively to arrest the bar 5. Thus, for example, if the dead weight of the bar 5 is 131 grams, the dead weight of the gear 16 should be approximately 86 grams when based on 65%. Moreover, it has also been determined that sufficient clearance 20 is provided by cutting the teeth 18 and 19 approximately .020 inch deeper than standard gear teeth.

Should, for some unexpected reason, the movement of the bar 5 towards the stop 15 be slower than the speed of rotation of the gear 16, the momentum acquired by the latter impels the teeth 19 thereof against the right sides of the teeth 18 and thereby drives the bar against the stud 15, thus assisting in the homing movement of the latter.

Ordinarily, a simple gear 16 is sufficient to obtain the desired results. However, under some conditions the weight of the gear may not be sufficient to control the mechanism properly. Such a condition may exist if the gear is used as a motion equalizer and homing aid for a machine such as an adding machine, a cash register, or an accounting machine. In such machines, the load on the driving means varies at different points during a machine cycle. In such an application, the gear 16 meshes with a companion member on the main drive shaft, and then, if the shaft slows up due to a heavy load at certain points in the machine cycle, the gear 16 runs ahead and, through the flywheel effect, assists the machine over the load. Then, if the machine speeds up when it passes the hump of the load, the machine will have to pick up the gear 16, which has a tendency to prevent excessive acceleration.

In many electrically-operated cash registers and accounting machines, the current through the motor is cut off before the machine reaches its home position, and the momentum of the machine parts is depended upon to carry the machine home. If, as sometimes occurs, the machine does not coast all the way home, it cannot be released for a succeeding operation until it is brought home by a manual means. The loose running gear, having a flywheel effect, will assist the machine in moving all the way home. In such applications, the loose gear 16 must be better balanced and weighted to become effective for such purpose. In such a use, the gear 16 (Fig. 2) is provided with one or more raceways or internal cavities 22 therein which are partly filled with a freely movable heavy substance such, e.g., as powdered metal, or lead shot, 23, number 12 shot being particularly effective.

When the cavities are partly filled in this way and the gear, whilst in rotation, is suddenly stopped, the shot 23 will surge in the previous direction of movement of the gear to impinge against the walls of the cavities thus tending to inhibit change of movement of the gear and further damping the action of the machine. If, on the other hand, the machine stops prematurely, the shot, impinging against the walls of the cavities 22 will tend to continue to move the gear to overcome the stalling of the machine.

The shot 23 is held within the cavities by means of a close fitting plate (not shown) secured to the side of the gear.

The loose running gear 16 is also useful in controlling the operation of differentially-movable devices, such as differential actuators in adding machines, cash registers, and accounting machines, where the rack may be arrested in different positions under control of value manipulative devices, and the stopping position varies with each operation. Thus, when one digit is entered in a totalizer, the rack moves a lesser extent than when nine digits are entered. The loose running gear damps the action of the actuator automatically, no matter in which position it is arrested.

The inertia damping device is also useful in line-finding mechanisms in the types of machines referred to above. The line-finding mechanisms of such machines must stop at one of a number of positions that are not in regular sequence; for instance, a line-finding table of an accounting machine may stop at line thirty-eight in one operation, line three in the next, and line nineteen in another. In any event, the loose running gear is effective in any line position.

As illustrated, the loose gear 16 is shown in mesh with the bar 5, which moves in a straight, or rectilinear, line. The gear 16 is equally

effective when applied to parts having rotary motion.

What we claim is:—

1. A rebound damping and homing device for assisting the homing of a moving machine part against a fixed stop and inhibiting rebound from the said stop, in which the device includes teeth on the machine part which intermesh with teeth of a rotatable gear, the latter teeth being narrower than the space between the teeth on the machine part so that the gear has a limited independent rotation, whereby during a constant or progressive movement of the machine part the gear is driven thereby, whereas on the retardation of movement of the machine part or the stopping thereof by the fixed stop, the momentum of the gear causes it to make its independent rotation and its teeth to engage the rear of the teeth on the machine part thus to exert a force on the latter in the original direction of movement thereof either to continue to urge the part to its home position or to oppose rebound from the fixed stop.

2. A device according to Claim 1, wherein the teeth of the gear are bevelled and the gear is rotatable on an adjustable eccentric so that the clearance space between the two sets of teeth can be varied.

3. A device according to Claims 1 and 2, wherein the gear is provided with cavities therein and a predetermined amount of freely movable heavy substance within each cavity, whereby the cessation of momentum of the gear causes the substance to impinge against the walls of the cavities and thereby further assist the teeth of the gear in urging the machine part to its home position and in preventing rebounding movement of said machine part.

4. A rebound damping device for effecting the homing of a moving machine part against a fixed stop, substantially as herein described and as shown in the accompanying drawing.

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Agent for the Applicants.

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FIG. 1

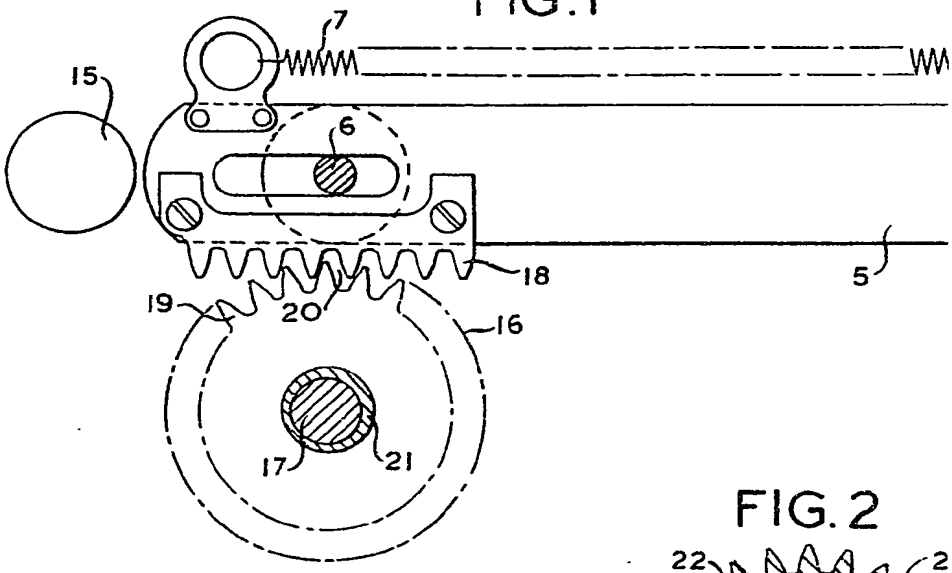
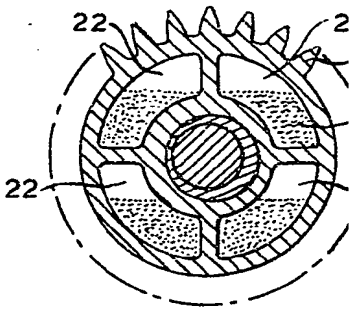


FIG. 2



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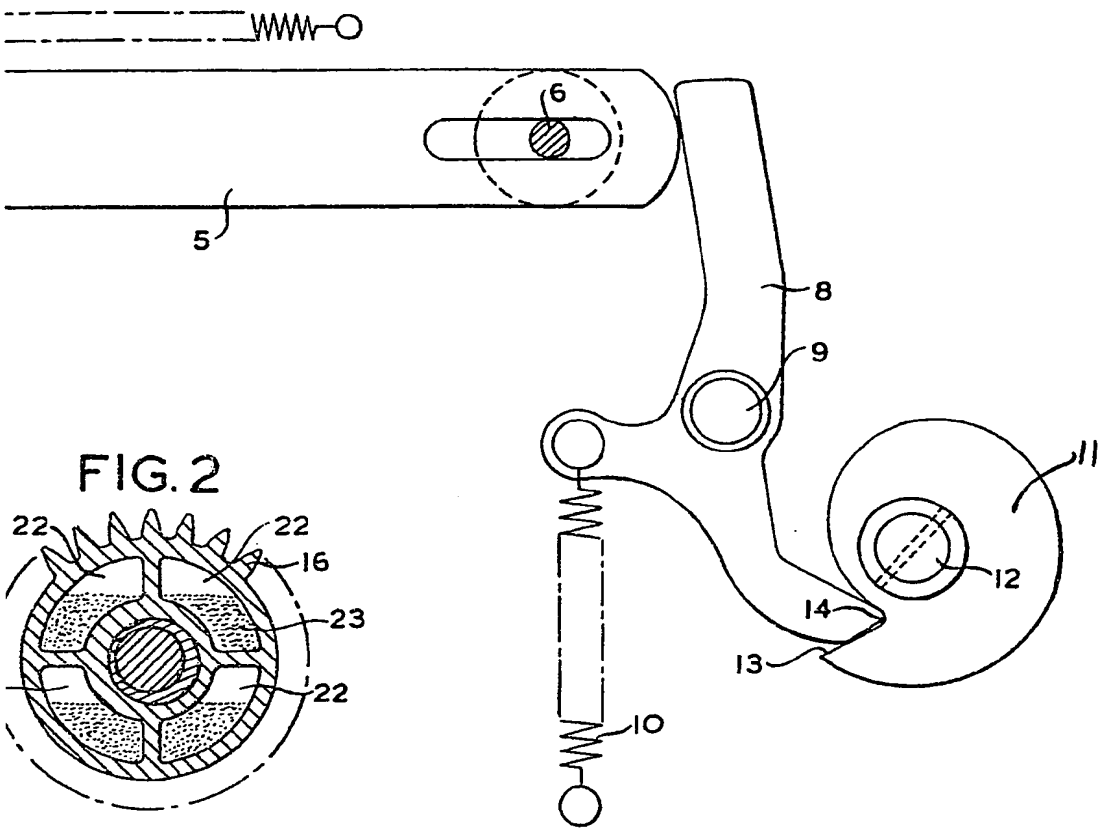

FIG. 2

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FIG. 1

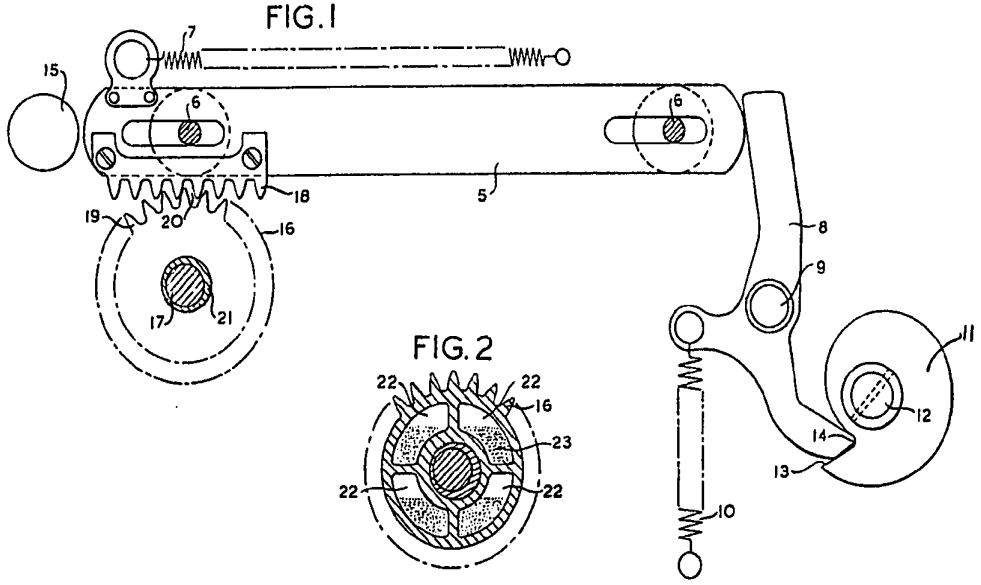


FIG. 2

FIG. 1

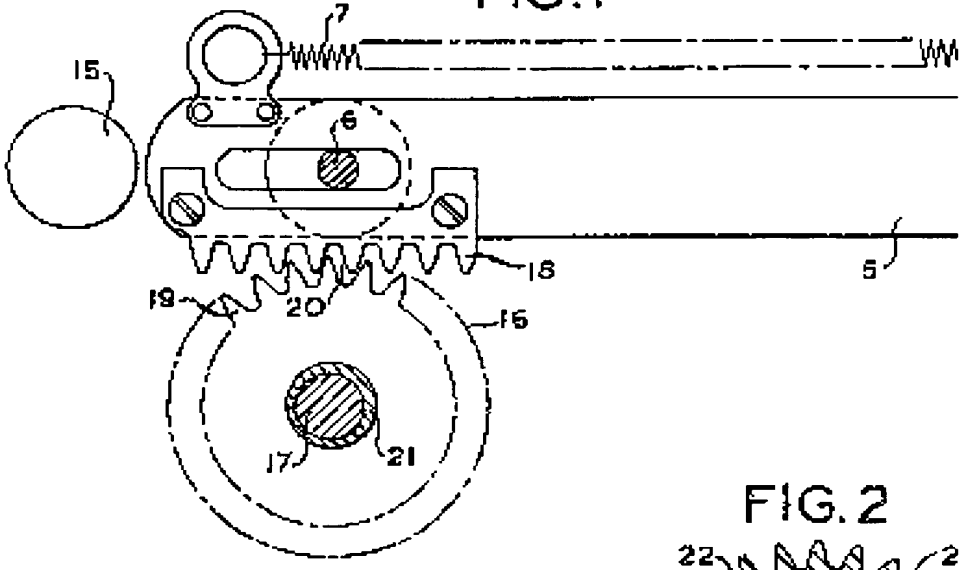
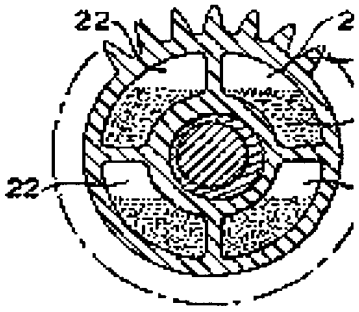


FIG. 2



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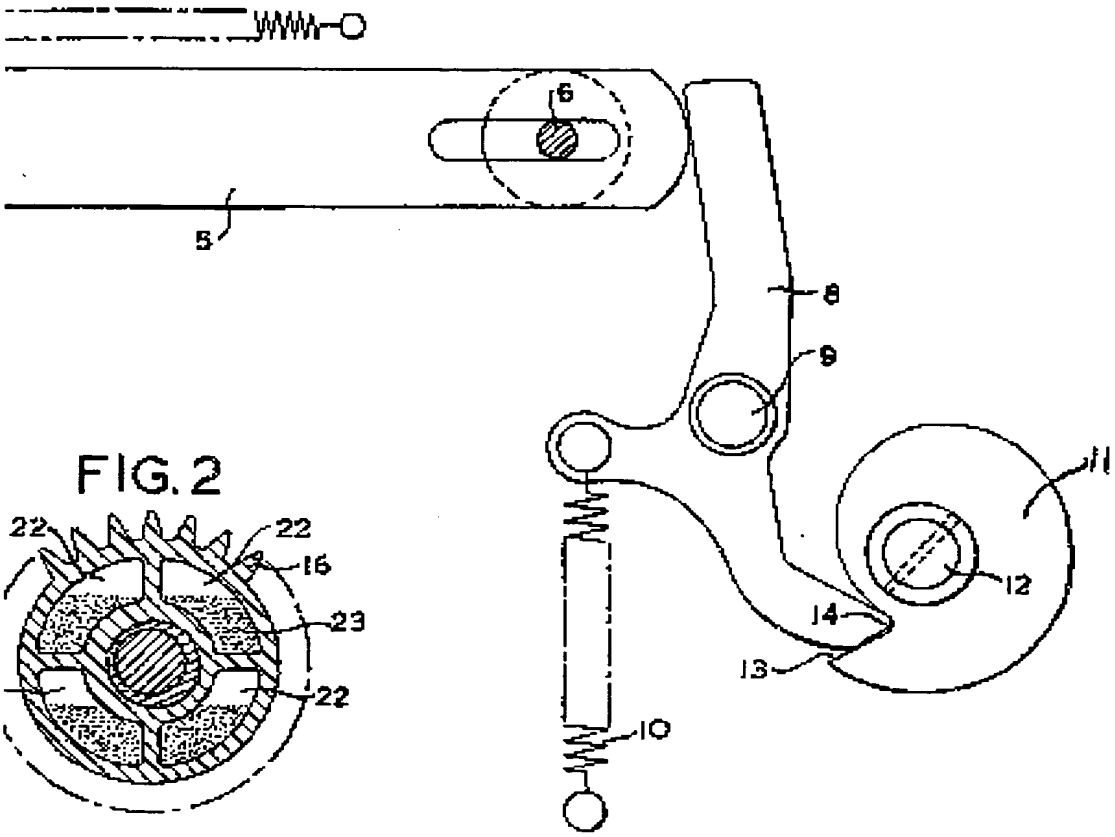

FIG. 2

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FIG. 1

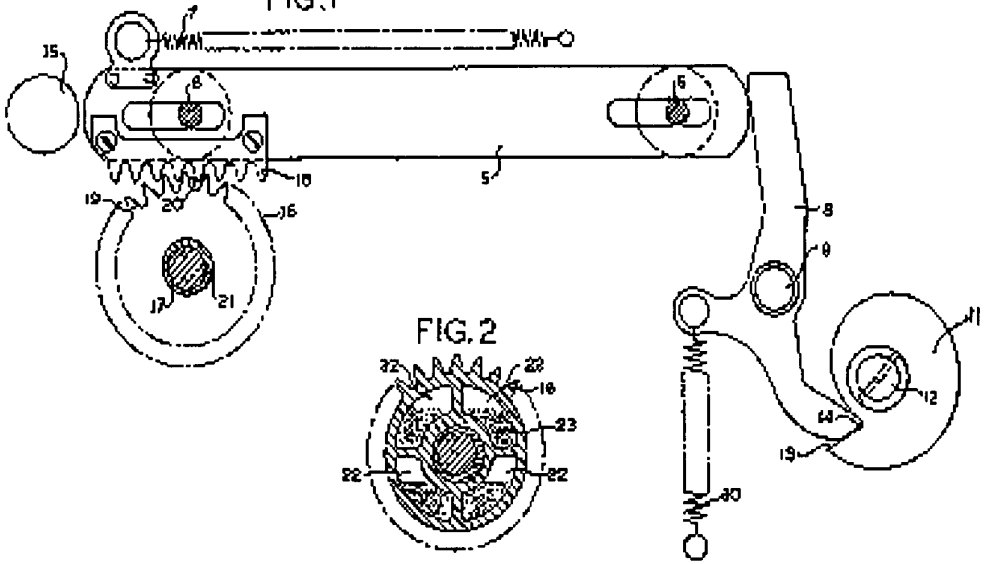

FIG. 2